

**BURNED-AREA REPORT  
(Reference FSH 2509.13)****PART I - TYPE OF REQUEST****A. Type of Report**

1. Funding request for estimated emergency stabilization funds  
 2. Accomplishment Report  
 3. No Treatment Recommendation

**B. Type of Action**

1. Initial Request (Best estimate of funds needed to complete eligible stabilization measures)  
 2. Interim Report # \_\_\_\_\_  
     Updating the initial funding request based on more accurate site data or design analysis  
     Status of accomplishments to date  
 3. Final Report (Following completion of work)

**PART II - BURNED-AREA DESCRIPTION**

- |  |  |
|--|--|
| A. Fire Name: Terwilliger  | B. Fire Number: OR-WIF-180227                              |
| C. State: Oregon   | D. County: Lane County                                     |
| E. Region: Pacific Northwest (R6)  | F. Forest: Willamette National Forest                      |
| G. District: McKenzie River Ranger District  | H. Fire Incident Job Code: P6L3SB19 0618                   |
| I. Date Fire Started: 8/19/2018  | J. Date Fire Contained: 80% contained (final containment ) |
| K. Suppression Cost: \$22,835,421 as of 10/11/2018   |  |
| L. Fire Suppression Damages Repaired with Suppression Funds  |  |
| 1. Roads improved as fire line: 38.3 miles   |  |
| 2. Dozer lines not on roads: 3.0 miles; all to have drainage installed through suppression repair. |  |
| 4. Hand lines: 4.7 miles; all to have drainage installed through suppression repair.               |  |
| 5. Miles of road treated, non-fire line: 74.5 miles  |  |
| 6. Other – drop points, staging areas, helispots, safety zones, pump chances, spills, etc.         |  |

M. Watershed Number:

- o 6<sup>th</sup> Field Watersheds

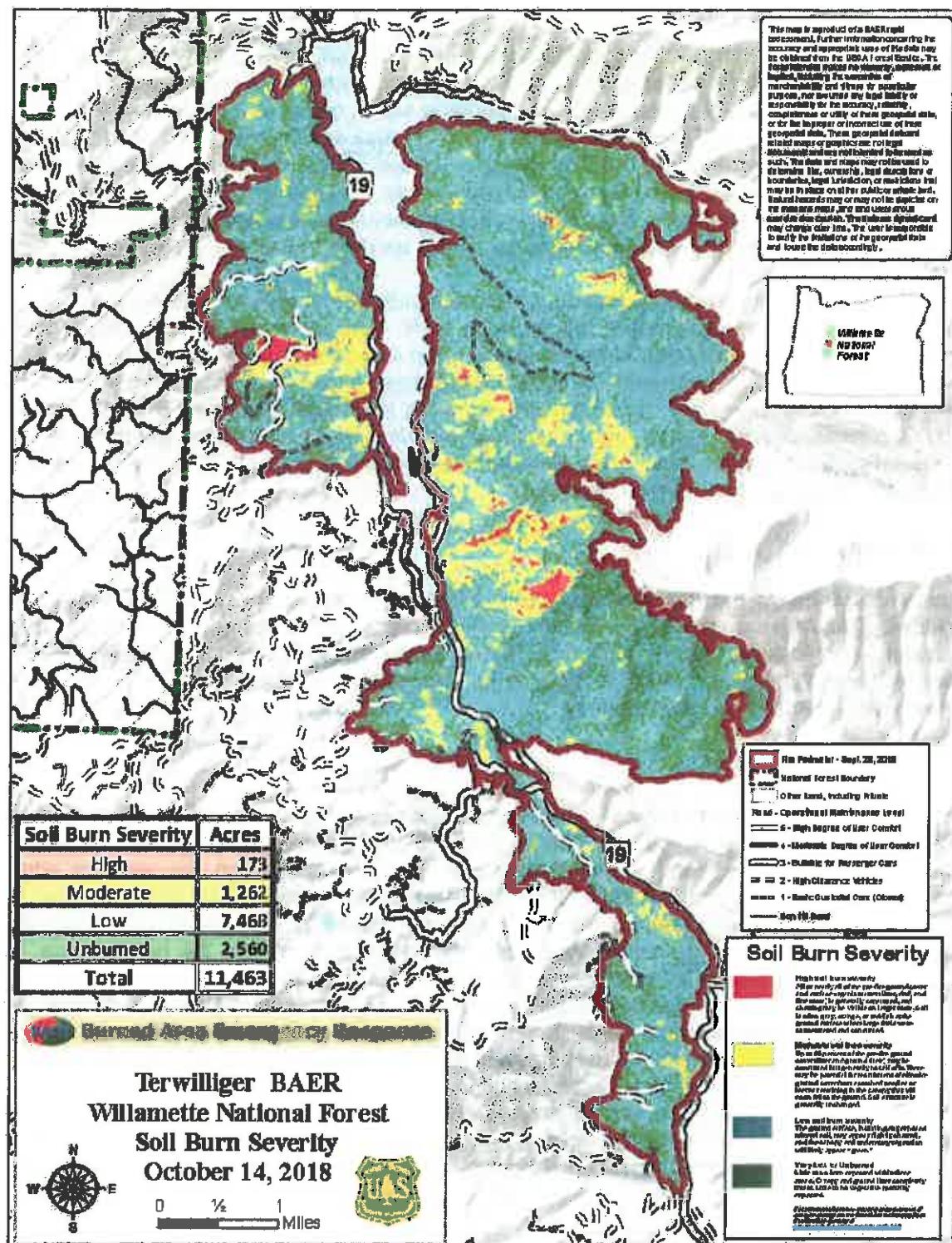
- 170900040304 - Rebel Creek – South Fork McKenzie River
- 170900040305 - French Pete Creek
- 170900040306 - East Fork South Fork McKenzie River
- 170900040307 - Cougar Reservoir – South Fork McKenzie River

**Total acres, Soil Burn Severity (SBS) by Subwatershed**

Subwatershed Name	Subwatershed Acres & % Burned	Soil Burn Severity			
		High (acres)	Moderate (acres)	Low (acres)	Unburned (acres)
Cougar Reservoir-South Fork McKenzie River	19,513 (40%)	172 (1%)	1,145 (6%)	5,237 (27%)	1,335 (7%)
East Fork South Fork McKenzie River	12,926 (7%)	0 (0%)	12 (0%)	476 (4%)	444 (3%)
French Pete Creek	20,121 (6%)	0 (0%)	27 (0%)	804 (4%)	436 (2%)
Rebel Creek-South Fork McKenzie River	16,937 (8%)	0 (0%)	80 (0%)	951 (6%)	344 (2%)
<b>Grand Total</b>	<b>69,497 (16%)</b>	<b>172 (0%)</b>	<b>1,264 (2%)</b>	<b>7,468 (11%)</b>	<b>2,559 (4%)</b>

N. Total Acres Burned:

NFS Acres (11,463) Other Federal (0) State (0) Private (0)



Terwilliger Fire Soil Burn Severity

#### O. Vegetation Types:

The vegetated habitat in the Terwilliger fire area varies along an elevational and aspect gradient. Four major plant series are present: Douglas-fir, grand fir, western hemlock, and Pacific silver fir. Douglas-fir series is typically found on warm, dry sites and lower to mid elevations. West-side grand fir tends to occupy cool, dry and well drained soils. Sites usually have rocky or ashy soils and are found on lower to mid elevations. Western hemlock forests are found on warm, moist sites where snow packs are usually not deep or long lasting. They are found on lower to mid elevations. Pacific silver fir is located on mid to upper elevations. The sites are cool, and wet with persistent snow packs that shorten their growing season.

Deciduous shrubs that commonly dominate or co-dominate the understory are Alaska huckleberry (*Vaccinium alaskaense*), big huckleberry (*V. membranaceum*), red huckleberry (*Vaccinium parvifolium*), rhododendron (*Rhododendron macrophyllum*), vine maple (*Acer circinatum*), devil's-club (*Olopaeax horridus*), baldhip rose (*Rosa gymnocarpa*), currants (*Ribes* spp.), and creeping snowberry (*Symporicarpos mollis*). Important evergreen shrubs include salal (*Gaultheria shallon*), wintergreen (*Gaultheria ovatifolium*), dwarf Oregon grape (*Mahonia nervosa*), Pacific rhododendron (*Rhododendron macrophyllum*), beargrass (*Xerophyllum tenax*), and Oregon boxwood (*Paxistima myrsinites*).

#### P. Dominant Soils:

Dominant soils inside the fire perimeter are predominantly andisols and inceptisols with lithic modifiers. They are composed of shallow gravelly loamy sands formed from residuum and colluvium from volcanic parent materials. These areas consisted of steep slide-slopes and ridges with slopes ranging from 30 to 90 percent. The infiltration rate of these soils are high due to the coarse texture and gravel content.

#### Q. Geologic Types:

The burned area landscape is split between two distinct volcanic subgroups of the Cascade Range geologic province, which was split by a extensional down-dropped graben seven million years ago. The Cougar Fault trends north-south, and trends through the western edge of Cougar Reservoir (former South Fork McKenzie River valley bottom). East of the Cougar Fault is the High Cascades, Pliocene to present in age, dominated by large stratovolcanoes, shield volcanoes, recent lava flows, cinder cones and tephra deposits. Within the burned area, High Cascade lava flow remnants cap ridges of the older underlying, West Cascades volcanics. The High Cascades have been highly sculpted by Pleistocene glaciers, with abundant till and glacial landforms. West of the Cougar Fault, the Western Cascades, Eocene to Miocene aged, are primarily composed of andesitic to basaltic volcanic lava flows, mudflows and tephra with steep, dissected mountain slopes. West Cascade slopes of east aspect, west of Cougar Reservoir, are geologically mapped as mantled by deep-seated landslide terrain. Earthflows and slumps at the toe of Boone Creek have experienced recent activity. Subsurface hydrothermal circulation is expressed at the ground surface at Terwilliger Hot Springs.

R. Miles of Stream Channels by Order or Class:

<b>Stream Type</b>	<b>Miles</b>
Intermittent Stream	104
Perennial Stream	34
<b>Grand Total</b>	<b>138</b>

S. Transportation System

**Trails:** 12.4 miles

**Wilderness:** 8.8 miles

**Non-Wilderness:** 3.6 miles

**Roads:** See Table Below

<b>Roads by Operational Maintenance Level</b>	
<b>Operational Maintenance Level</b>	<b>Grand Total</b>
1 - BASIC CUSTODIAL CARE (CLOSED)	8.4
2 - HIGH CLEARANCE VEHICLES	25.3
3 - SUITABLE FOR PASSENGER CARS	2.3
4 - MODERATE DEGREE OF USER COMFORT	0.3
5 - HIGH DEGREE OF USER COMFORT	10.0
DECOMMISSIONED	0.1
Non FS Roads	0.1
<b>Grand Total</b>	<b>46.5</b>

### PART III - WATERSHED CONDITION

#### A. Burn Severity (acres):

Soil Burn Severity	Acres	Percent of Burned Area
Unburned	2,560	22.3%
Low	7,468	65.1%
Moderate	1,262	11.0%
High	173	1.5%
Total	11,463	100.0%

#### B. Water-Repellent Soil (acres):

Water Repellency	Acres
High	1,435
Moderate	7,468
Low	2,560

#### C. Soil Erosion Hazard Rating (acres):

265 (low) 7,280 (moderate) 3,918 (high)

#### D. Erosion Potential: (tons/acre) from Disturbed WEPP model (Elliot, RMRS)

Year	Unburned	Low	Moderate	High
1st	0	0.3	0.93	1.31

E. Sediment Potential: Not calculated – expected to be low based on a) the fairly low (13% combined) percentage and patchy distribution of moderate and high soil burn severity across the burned area; 2) the low erosion potential figures generated by the WEPP model; and c) the common presence of remnant live vegetation and ground cover downslope of most moderate and high burn severity areas. Consequently, sediment delivery potential is judged to generally be low, and sedimentation is not likely to measurably or adversely affect downstream and downslope resources such as aquatic habitat, drinking water quality, or reservoir capacity. Local modest and transitory effects may be expected during the first winters following the fire.

## **PART IV - HYDROLOGIC DESIGN FACTORS**

- A. Estimated Vegetative Recovery Period, (years): 3 – 5 years
- B. Design Chance of Success, (percent): 80%
- C. Equivalent Design Recurrence Interval, (years): 2 years
- D. Design Storm Duration, (hours): 24 hours
- E. Design Storm Magnitude, (inches): 3.5 – 4.2 inches
- F. Design Flow, (cubic feet / second/ square mile): 40.63 cfs/mi<sup>2</sup>
- G. Estimated Reduction in Infiltration, (percent): 12.5%
- H. Adjusted Design Flow, (cfs per square mile): 41.16 cfs/mi<sup>2</sup>

## **PART V - SUMMARY OF ANALYSIS**

- A. Describe Critical Values/Resources and Threats:

### **Hydrologic Response:**

The Terwilliger Fire burned primarily within the Cougar Reservoir – South Fork McKenzie River watershed and in the watersheds of smaller tributaries to the South Fork McKenzie River. The watershed response in the burned area is expected to include an initial flush of ash and fine sediment, rill and gully erosion in drainages and steep slopes within the burned area, as well as increased peak flows, channel scouring, and sediment deposition. Responses are expected to be most evident during initial larger storm events immediately after the fire. Thereafter, responses are expected to become less apparent as vegetation is reestablished, providing ground cover, increasing surface roughness, and stabilizing and improving the infiltration capacity of the soils.

Minor increases in runoff are expected in watersheds within the burned area. This is due to the very low amount of moderate and high soil burn severity within the burn area (13%). The increases in flow could lead to plugged culverts, flows over road surfaces, and erosion or deposition along road surfaces and ditches.

Hydrologic design factors used to analyze the effects of the Terwilliger Fire considered the vegetative recovery period to be 3 to 5 years; treatment chance of success as 80%. Storm recurrence interval of 2 years and 24-hours yielded a design storm magnitude of 3.5 – 4.2 inches of rainfall. Estimated reduction in infiltration was based on the percentage of highly hydrophobic soil in the burn area, which was determined to be 12.5%. Pre-fire design flow was estimated at 40.63 cubic feet per second per square mile and post-fire design flow was estimated at 41.16 cubic feet per second per square mile. These values vary by watershed analyzed and are described in detail along with the analysis methodology in the hydrology and watershed specialist report.

### Erosional Response

The change in erosion potential and sediment yield from pre- to post fire conditions was estimated using the Forest Service Disturbed Water Erosion Prediction Project (WEPP) model. The general data requirements for Disturbed WEPP are climate data, soil texture, rock fragments, general vegetation type, slope gradient, horizontal slope length and burn severity. These tools are useful for comparing the relative difference between pre- and post-fire erosion potential.

Averaged model estimates indicate that overall, there could be hillslope erosion increase of 0.93 - 1.31 tons per acre basis in the first year post-fire from ground where soil burn severity was moderate or high. It is assumed only a portion of sediment will be delivered based on field observations such as; slope roughness, high amount of surface rock fragments and downed large woody debris that would function as sediment delivery interrupters. The high burn severity areas are mostly buffered by moderate and low burn severity, providing a buffer for sediment delivery. These estimated output numbers, along with low amount of high burn areas, as well the mosaic of the burn, indicate that large-scale sediment response should not be expected.

### Geologic Response

Modeling results generally support field observations that indicate there will be limited post-fire geologic response from a 10-year recurrence interval storm event. Only 7% of drainages have a probability greater than 0.40 for the occurrence of debris flows. Drainages at highest risk for debris flow initiation include Boone Creek, unnamed drainage north of Slide Creek, unnamed drainage between Slide and Smith Creeks, and Smith Creek (see Figure 3 below).

The model design precipitation event is a 15-minute – 24mmh (short duration - high intensity storm) – these types of events are less typical for this western Oregon compared to the intermountain area. The western Cascades receive longer duration storms of lower intensity which generate most debris flows.

Initial observations in the field and from aerial reconnaissance indicates the drainages highlighted have a lower likelihood of debris flow discharge than the model predicts, due to sinuosity of stream channels and roughness of channels. Nonetheless, these channels may present at least the possibility of generating damaging debris flows under known historic conditions.

**Critical Values:**

The table below is Exhibit 02 from FSM 2523.1. This matrix was used to evaluate the risk level for each critical value identified during this BAER assessment. See FSM 2523.1 for additional information.

Probability of Damage or Loss	Magnitude of Consequences		
	Major	Moderate	Minor
	RISK		
Very Likely	Very High	Very High	Low
Likely	Very High	High	Low
Possible	High	Intermediate	Low
Unlikely	Intermediate	Low	Very Low

The table below is a summary of the values which were identified as 'critical' per Exhibit 01 from FSM 2523.1 within and along the Terwilliger Fire area, as well as the threats to those values, the probability of damage or loss, magnitude of consequences and the resulting level of risk. Some non-critical or non-BAER values are included where a high level of attention or controversy merits their inclusion as discussion items. Red shaded cells are those values that rated out as "very high" or "high" risk. Yellow shaded cells rated out "intermediate" risk and green cells rated out "low" or "very low".

Life/ Property/ Resources	Critical Value	Threat to Critical Value	Probability of Damage or Loss	Magnitude of Consequence	Risk	Treatment	Notes
Property	FSR 1900	Road failure or diversion at stream crossings and drainage culverts along Road 1900 could cause substantial property damage	Likely: Sediment and wood delivery from many hillslopes with M and H SBS is likely to enter road drainage structures	Moderate: If road failure or diversion occurred at high risk stream crossings, the loss of property would be considered moderate. Others would require	High	Storm Inspection and Response (RT2)	ML 5 important road, National Scenic Byway, Forest not likely to close for a full year, High/Mod SBS in Boone Creek drainage has increased risk of debris flows

				cleaning			
Life	FSR 1900	Post-fire increase in rockfall expected along important ML5 road with heavy vehicle traffic	Possible. Due to the large area of potential rockfall, it is possible that a motorist, cyclist, or hiker could get struck by falling or already fallen rock, trees, or debris. Common rockfall will increase post-fire.	Major. If a motorist were to encounter a rockslide unaware, major injury or loss of life could occur.	High	Road Hazard Signs (P1a)	Some scaling occurred during incident to reduce risk of rockfall, but signage is still needed to protect life and safety
Property	FSR 1900-500	Road failure or diversion at stream crossings and drainage culverts along Road 1900-500 could cause substantial property damage	Likely. Sediment and wood delivery from many hillslopes with M and H SBS is likely to enter road drainage structures	Moderate. Crossings have variable degrees of susceptibility to plugging or other damage, some portion would require cleaning	High	Storm Inspection and Response (RT2)	ML 2/3; High/Mod SBS above, but large fill/catchment basins at culverts, ask USACE about supplemental funding to upgrade road
Life	FSR 1985-115	Post-fire hazards present, including unstable rock, soil and hazard trees - recommend closure (with existing gate)	Possible. Much of the road passes through moderate or high SBS where instability is common and debris hazards are prevalent	Major. Consequences of encountering post-fire hazards such as rocks, trees or failed road prism on this narrow ML2 road could be fatality or serious injury	High	P10 (Closure)	ML 2; High/Mod SBS above, pre-existing landslide and tension cracks
Life	Terwilliger Hot Springs	Vault toilets burned exposing hazardous material (human)	Very Likely. Vaults are full and exposed by the fire,	Moderate to Major. Minor to serious	Very High	Hazardous	

		excrement)	release would contaminate soils and groundwater near human water contact recreation areas	illness could occur from exposure to infectious waste		Materials (P5)	
Life	Terwilliger Hot Springs	Hot springs rock wall is adjacent to stream with increased movement of debris that could block stream and cause avulsion into the sequence of hot springs rock pools and pose a threat to public. Hazard trees present	Possible: The drainage upslope of the site is projected to have only a minor flow increase, but there is abundant mobile debris on the slopes and in the channel	Major: Impact from falling rock, flood debris or hazard trees could cause serious injury or death	High	Site Closure (P10)	
Life	3319 Rider Creek Trail	Post-fire hazards present, including unstable rock, soil and hazard trees.	Possible: Mostly moderate SLOPs, steep slopes above trail, many burned and leaning trees	Major: Impact from falling rock, debris or hazard trees could cause serious injury or death.	High	Trail/Recreation Hazard Signs (P1b)	
Property	3319 Rider Creek Trail	Wooden cribs burned, leaving trail at high risk of failure	Very Likely: Due to very steep slopes (~45%) above and below trail with High/Mod SBS, there is a very high likelihood of trail failure with winter runoff	Moderate: Due to the steep slopes, if trail failure occurs, material will have to be imported to properly reconstruct. Property loss would be moderate	Very High	Trail Infrastructure Protection (RT14)	Construct temporary retaining wall and stabilize trail tread
Life	3308 East Fork Trail	Post-fire hazards present, including unstable rock, soil and hazard trees	Possible: steep slopes above trail, many burned and leaning trees, mobile debris	Major: Impact from falling rock, debris or hazard trees could cause serious injury or	High	Trail/Recreation Hazard Signs (P1b)	

				death			
Life	3329 Lowder Mountain Trail	Post-fire hazards present, including unstable rock, soil and hazard trees	Possible: steep slopes above trail, many burned and leaning trees, mobile debris	Major impact from falling rock, debris or hazard trees could cause serious injury or death	High	Trail/Recreation Hazard Signs (P1b)	
Life	3311 French Pete Creek Trail	Post-fire hazards present, including unstable rock, soil and hazard trees	Possible: steep slopes above trail, many burned and leaning trees, mobile debris	Major impact from falling rock, debris or hazard trees could cause serious injury or death	High	Trail/Recreation Hazard Signs (P1b)	
Property	3311 French Pete Creek Trail	Trail infrastructure damage or loss expected with increase in post-fire runoff and erosion	Very Likely: Due to very steep slopes (~50%) above and below trail with Mod SBS, there is a very high likelihood of trail failure with winter runoff	Moderate. Due to the steep slopes, if trail failure occurs, the trail will have to be completely reconstructed. Therefore, the loss of property would be considered moderate	Very High	Drainage (RT13)	
Life	South Fork McKenzie River	Post-fire hazard trees will continue to fall into the river causing significant threat to boaters	Possible: If boaters are unaware of the post-fire hazards in the river that have already occurred, such as downed trees and rocks, it is possible that they could get in a situation that could cause serious injury or death	Major impact with channel hazards could cause serious injury or death	High	Trail/Recreation Hazard Signs (P1b)	Hazard signs will be posted at boating put-in

Resources	South Fork McKenzie River above Cougar Reservoir (Wild and Scenic Study River)	Potential for increased flows, sediment, debris, and nutrient loads and impacts to ORVs (Scenery, Recreation, Fish and Prehistoric)	Likely: Although increases in flow, sediment, and nutrient loads are projected to be minor, a substantial increase in large woody material in the river has already been observed and more is expected to occur in the near future. This increase in wood loading is likely to eliminate recreational boating opportunities, which affects the Recreation ORV	Minor: Because increased wood loading is a natural process, the impact to ORVs is considered minor. (There is, however, a high risk to Life and Safety, which has been addressed above.)*	Low	No Treatment	Wild and Scenic Study River, Municipal water supply, Hydropower at Cougar Dam
Resources	South Fork McKenzie River below Cougar Reservoir (Municipal Water Supply)	Potential for increased flows, sediment, debris and nutrient loads to impact drinking water 50 miles downstream	Unlikely: Burned area near Cougar Reservoir is quite far (50 miles) from the water supply intake	Moderate: Contamination above acceptable levels might result in damage to treatment facilities or interruptions in service	Low	No Treatment	Wild and Scenic Study River, Municipal water supply, Hydropower at Cougar Dam
Resources	Soil Productivity	Decrease in soil productivity	Possible: Low burn severity in majority of fire, forest floor intact; nutrient inputs from needle cast	Moderate: Soil loss might impede vegetative recovery, but not create irretrievable ecosystem changes.	Intermediate	None	
Resources	Bull Trout	South Fork McKenzie River and Cougar Reservoir – very important for rearing, foraging,	Unlikely: Waterbodies occupied by bull trout are not projected to receive a large	Minor: Because there is no bull trout spawning in areas	Very Low	None	Treatments to reduce risk to roads will benefit bull trout

		and overwintering. Mass wasting or road failure/diversion could deliver large amounts of sediment which could have detrimental effects to fry, juveniles, and adults	Increase in sediment	Affected by the fire, the magnitude of consequence would be minor			
Resources	Spring Chinook Salmon	South Fork McKenzie River - very important for spawning and rearing, French Pete Creek - important for spawning and rearing, Cougar Reservoir - important for rearing, East Fork of the South Fork – not important for spawning or rearing. Mass wasting or road failure/diversion could deliver large amounts of sediment which could have detrimental effects to eggs, fry, and juveniles	Waterbodies occupied by Chinook are not projected to receive a large increase in sediment	Moderate: Because these streams are important areas, a large sediment delivery event could have considerable, long-term effects to the local population	Low	None	Treatments to reduce risk to roads will benefit spring Chinook salmon
Resources	Bull Trout Critical Habitat	Increased temperature, flows, sediment, debris flows and nutrient loads may impact habitat and water quality in South Fork and Cougar Reservoir; Mass wasting or road failure/diversion could deliver large amounts of sediment which could have long-term impacts to Critical	Waterbodies occupied by Chinook are not projected to receive a large increase in sediment	Minor: Because there is no bull trout spawning, the magnitude of consequence would be minor	Very Low	None	Treatments to reduce risk to roads will benefit bull trout CH

		Habitat					
Resources	Spring Chinook Salmon Critical Habitat	Increased temperature, flows, sediment, debris flows and nutrient loads may impact habitat and water quality. Mass wasting or road failure/diversion could deliver large amounts of sediment which could have long-term impacts to Critical Habitat,	Unlikely. Chinook CH is not projected to receive a large increase in temperature, flows, sediment, or nutrient loads	Moderate: Because the South Fork is a very important spawning stream, impacts could have considerable, long-term effects to the local population	Low	None	Treatments to reduce risk to roads will benefit spring Chinook salmon CH
Resources	Quality and quantity of remaining Northern Spotted Owl Critical Habitat and suitable habitat	Continued loss of habitat from post-fire stress, wind and storm events and post-fire insect and disease	Possible	Minor: The territories have not supported nesting owls in recent years likely due to the suboptimal habitat conditions prior to the fire.	Low	None	Overall low degree of post-fire effects in terms of post-fire effects. There may be minor loss of habitat related to watershed processes (principally landsliding in higher burn severity patches), in addition to the existing and projected tree mortality from other causes.
Resources	Heritage Resources	Impacts to heritage resources from post-fire effects, including threats from erosion or unauthorized removal of artifacts	Possible: Some sites have been buffered and are unlikely to be exposed. There are some unsurveyed sites that may be affected.	Undetermined	Undetermined	None at this time	No heritage assessment performed. There are known sites within the burned area. The District archeologist believes risk is low. Some known sites were noted and buffered during post-suppression activities (danger tree)

								removal), and are unlikely to be exposed to post-fire effects. There may be exposed sites along Road 1900-500 from Slide Creek Campground north, per a heritage REAF. The District program will assume responsibility for protective measures if needed, or an interim BAER assessment is possible if threats become evident
Resources	Native Plant Communities	Noxious weeds at high risk of expansion and impact to native communities	Very Likely. Existing weed populations, large amounts of fire- and suppression-related disturbance, nearby native populations are already affected to various degrees	Major Aggressive invasive weeds (particularly false brome and spotted knapweed) if established are likely to cause major disruption of native plant communities	Very High	Invasives EDRR (L1a, L1b)		EDRR in danger/ tree removal areas will be covered under suppression repair (P-code). Other suppression features such as dozer and hand lines will be treated with BAER funds

## B. Emergency Treatment Objectives:

The primary objective of this Burned Area Emergency Response Report is to recommend prompt actions deemed reasonable and necessary to effectively protect, reduce or minimize significant threats to human life and property and prevent unacceptable degradation to natural and cultural resources. The application of these BAER treatments are expected to minimize on-site and downstream damages to the identified critical values previously mentioned. The emergency treatments being recommended by the Terwilliger Fire BAER Team are specifically designed to achieve the following results:

### Proposed Land Treatments

The objective of the land treatments are to:

1. Promote and protect native and naturalized vegetative plant communities by reducing the spread of noxious weeds (L1a – Early Detection and Emergency Response (EDRR) - Burned Area, L1b – EDRR - Fire Suppression Features).

### Proposed Channel Treatments:

There are no proposed channel treatments.

### Proposed Road and Trail Treatments

The objective of the road and trail treatments are to:

1. Protect road and trail investments from becoming impassible and damaged due to increased post-fire runoff (RT2 - Storm Inspection and Response - Roads 1900, 1900-500; RT14 – Trail Infrastructure Protection – 3311 French Pete Trail, 3319 Rider Creek Trail).
2. Reduce sedimentation into streams degrading water quality (RT2 - Storm Inspection and Response, RT13 – Trail Drainage - 3311 French Pete Trail, RT14 – Trail Infrastructure Protection - 3319 Rider Creek Trail).

### Proposed Protection/Safety Treatments:

The objective of the protection/safety treatments are to:

1. Protect human life and safety by raising awareness through posting hazard warning signs at recreation sites, trailheads (3308 East Fork Trail, 3311 French Pete Trail, 3319 Rider Creek Trail, 3329 Lowder Mountain Trail) and when entering the burned area and traveling Aufderheide Scenic Byway (Road 1900) (P1a – Road Hazard Signs, P1b – Trail/Recreation Hazard signs).
2. Remove and cleanup hazardous human waste from burned toilet vaults at Terwilliger Hot Springs (P5 – Hazardous Materials).
3. Protect infrastructure investment of Terwilliger Hot Springs pools (P6 – Infrastructure Protection).
4. Protect human life and safety by temporary closure of Road 1985115 (existing gate) and Terwilliger Hot Springs recreation site (P10 – other – Administrative Closure).

## C. Probability of Completing Treatment Prior to Damaging Storm or Event:

Land 70%      Channel N/A      Roads/Trails 75 %      Protection/Safety 90 %

## D. Probability of Treatment Success

Treatment	Years after Treatment		
	1	3	5
Land	70	75	80
Channel	NA	NA	NA
Roads/Trails	80	85	90
Protection/Safety	85	90	95

E. Cost of No-Action (Including Loss) - for roads, trails, hot springs infrastructure: **\$566,258**

*Derived from: Estimated Valuation Of Property x Probability Of Loss Without Treatment*

F. Cost of Selected Alternative (Including Loss): **\$56,350**

G. Skills Represented on Burned-Area Survey Team:

- |   |  |   |   |
|---|--|---|---|
| <input checked="" type="checkbox"/> Hydrology | <input checked="" type="checkbox"/> Soils    | <input checked="" type="checkbox"/> Geology | <input type="checkbox"/> Range                  |
| <input type="checkbox"/> Forestry             | <input checked="" type="checkbox"/> Wildlife | <input type="checkbox"/> Fire Mgmt.         | <input checked="" type="checkbox"/> Engineering |
| <input type="checkbox"/> Contracting          | <input type="checkbox"/> Ecology             | <input type="checkbox"/> Botany             | <input type="checkbox"/> Archaeology            |
| <input checked="" type="checkbox"/> Fisheries | <input type="checkbox"/> Research            | <input type="checkbox"/> Landscape Arch     | <input checked="" type="checkbox"/> GIS         |

Team Leader: Fred Levitan

Email: [flevitan@fs.fed.us](mailto:flevitan@fs.fed.us)

Phone: (541) 225-6366

Team Members:

<b>Team Member</b>	<b>Specialty</b>
Fred Levitan	Team Leader
Kate Meyer	Assistant Team Leader, Fisheries
Sarah Brame	Soils
Wendy Peterman	Soils (t)
Chris Stewart	Hydrology
Andrew Montgomery	Hydrology (t)
Bart Wills	Geology
Dylan McCoy	Recreation/Trails
Wayne Chevalier	Recreation/Trails
Danny Matthews	Engineering
Joe Doerr	Wildlife
Sarah Ward	Botany
David Keenum	GIS
Dorothy Thomas	GIS

## H. Treatment Narrative:

### Land Treatments:

#### **L1a - Invasive Weed Detection and Treatment (standard BAER):**

The Terwilliger Fire occurred in an area that has approximately 300 acres of existing mapped weed infestations and experiences high volumes of traffic by the public. Under BAER protocol for invasive plant detection and treatment, the focus will be on non-infested trails into the Three Sisters Wilderness where there is a high likelihood of spread of invasive plants from hikers passing through infested areas enroute to the wilderness. High and moderate burn severity areas will be targeted. There are approximately 46 acres along Trails 3329, 3330, and 3311, which enter the wilderness from roads 1900-500 and 1900. These roads are within 1/4-mile of National Forest Wilderness and have large existing populations of aggressive invasive species such as false brome and spotted knapweed, which are a threat to invade and seriously degrade the intact wilderness plant communities.

EDRR in burned areas (L1a) will occur on approximately 46 acres and estimated invasive plant treatments to occur across 7 acres (~15%). The average cost/acre of the combined treatment types is \$153/acre. **Total request for L1a is \$7,050.**

#### **L1b - Invasive Weed Detection and Treatment (fire suppression disturbance)**

Linear and small areal features disturbed by fire suppression (blading and scraping) are eligible for BAER funding as they may be available after suppression repair funds (P-code) are no longer available. For the Terwilliger Fire, it is proposed to survey 36 acres of bladed dozer line and scraped (hand line) linear features, and 12 acres of bladed small areal features (staging areas, drop points, helipads, safety zones, etc.) for a total of 45 acres. An estimated 40%, or 19 acres of these would require treatment. The unit cost would go up to \$239/acre. Suppression repair areas including dozer lines, landings and helipads are scattered throughout the burned area and often intersect inventoried sites and are near sensitive plant locations (see BAER guidance paper on Invasive Plant Threats for support of surveys in suppression areas). **Total request for L1b is \$11,450.**

\*\*Additional sites within danger tree removal areas where equipment drove off road will be seeded, surveyed and treated using suppression repair dollars (P-code)

EDRR Treatment Cost - Contract	Units	Unit Cost	# of Units	Total Cost
Invasive Plant Surveys (L1a)	Acres	\$100.00	46	\$4,600
Invasive Plant Treatments (L1a)	Acres	\$350.00	7	\$2,450
Invasive Plant Surveys ( L1b)	Acres	\$100.00	48	\$4,800
Invasive Plant Treatments (L1b)	Acres	350.00	19	\$6,650
<b>Total Treatment Cost</b>	Acres	\$197.00	94	<b>\$18,500</b>

Channel Treatments: None proposed.

Road and Trail Treatments:

Road Treatments:

**RT2- Storm Inspection and Response:** Storm inspection/response will keep culvert and drainage features functional by cleaning sediment and debris from in and around features between or during storms. This work will be accomplished through Forest Service Road Crew, equipment rental, and general labor. **Total request is for \$7,200.**

**Locations:**

FSR 1900000, FSR 1900500, FSR 1985115

Treatment	Units	Unit Cost	# of Units	Total Cost
Storm Inspection and Response	Days	\$1,800	4	\$7,200

Trail Treatments:

**RT13 – Trail Drainage:** *Treatment Description* - Work will include tread leveling and repair, including removal of soil deposits from erosion and runoff, and trail re-benching and/or outsloping. This work is necessary to retain the investment in the trail prism – replacement costs if it is lost would greatly exceed the cost of temporary stabilization (see analysis in the Recreation specialist report and the VAR Lite benefit-cost analysis, both in the project record.) Trail program manager and crew lead time for coordination with partners and contractors regarding trail conditions is included. Work will be completed with force account labor (reduced cost) if that is available at the time implementation is necessary, but should be completed before the onset of the winter rainy season. **Total request is for \$5,000.**

*Treatment Cost – (segments of French Pete Trail 3311 downslope of moderate burn severity areas.)*

Costs Estimate (per mile)				
Item	Cost	Quantity (Day)	Total	Notes
Contractor	\$1,000	10	\$10,000	Project Implementation
<b>Total:</b>				<b>\$10,000 per mile</b>

Trail Name & Number	Units	# of Units	Unit Cost	Total Cost
French Pete Trail 3311	Miles	.5	\$10,000	\$5,000

**RT14 – Trail Infrastructure Protection:** Work is similar to RT13, but includes temporary retaining walls to replace the wooden cribwalls burned in the fire. Absent these, the trail prism would quickly be eroded away during winter runoff from the moderate soil burn severity area upslope. The Forest would later replace these temporary supports with permanent structures using program funds. Trail program manager and crew lead time for coordination with partners and contractors regarding trail conditions is included. Work will be completed with force account labor (reduced cost) if that is available at the time implementation is necessary, but should be completed before the onset of the winter rainy season. **Total request is for \$7,500.**

*Treatment Cost – (entire Rider Creek Trail 3319 to Terwilliger Hot Springs.)*

Costs Estimate (per mile)				
Item	Cost	Quantity (Day)	Total	Notes
Contractor	\$1,500	10	\$15,000	Project Implementation
<b>Total:</b>				<b>\$15,000 per mile</b>
Trail Name & Number	Units	# of Units	Unit Cost	Total Cost
French Pete Trail 3311	Miles	.5	\$15,000	\$7,500

Protection/Safety Treatments:

**P1a – Road Hazard Signs:** Signs will inform users of the dangers associated with entering and recreating within the burned area. **Total request is for \$1,200.**

Locations: Small hazard warning signs located at intersections of FSR 1900000 and the fire perimeter. 1 sign for each direction of travel.

Treatment	Units	Unit Cost	# of Units	Total Cost
P1 - Installation of warning sign 30x48	Sign/Post	\$600	2	\$1,200

**P1b – Trail/Recreation Hazard Signs:** *Treatment Description* - Install warning signs to alert visitors of burned area post-fire effects on trails, at campsites, and at dispersed and developed use sites, to include trailheads, campgrounds, the Terwilliger Hot Springs visitor kiosk, and a popular boat launch site on the South Fork McKenzie River near French Pete Campground.

Treatment Cost: The unit cost of the sign includes labor cost for ordering and installation. Estimated 1 day needed for total sign installation time. Program management costs are also included in the unit costs. **Total request is for \$4,400.**

Treatment	Units	# of Units	Unit Cost	Total Cost
Trail warning signs for wilderness trailheads	Each	5	\$400	\$2,000
Dispersed site warning signs (outside of wilderness)	Each	3	\$400	\$1,200
Campground warning signs	Each	2	\$400	\$800
Terwilliger Hot Springs entrance	Each	1	\$400	\$400
<b>Total Cost:</b>				<b>\$4,400</b>

**P2 – Road Closure Devices:** Close the existing gate on Road 1985115 to deter public access to a high-severity burned area with hazard trees, erosion and debris flow hazards, and an existing landslide that has removed much of the road prism at approximately MP 2.7. **No Cost.**

**P10 – Closure** - The Forest also plans to install hard closure devices (secure gates) at three locations near the entrance of the burned area – on Roads 1900 near the north and south ends of the burned area and on Road 1985, primarily to deter access to Terwilliger Hot Springs while it is under closure order. The forest closure orders will extend through the winter, and may remain in place for up to one year. The BAER assessment would include recommendations for similar closures, had the Forest not preemptively decided to do so. **No Cost.**

#### ***Terwilliger Hot Springs Treatments***

**P5 – Hazardous Materials:** *Treatment Description* - Extract and remove hazardous human waste from the two burned fiberglass toilet vaults adjacent to the Terwilliger Hot Springs developed recreation site. Capping the vaults would still leave an unacceptable risk to human health and safety – any possible release and resultant contamination of the ground surface, groundwater and/or surface water, in close proximity to a developed recreation site where concentrated primary use is water contact recreation, would have major public health consequences and create a very high public health risk. If a release were to occur, the cost to clean up contaminated soil, water and vegetation would greatly exceed the estimated cost to remove the waste while it is still contained in the vaults.

**Treatment Cost:** Cost is estimated based on Forest Service administration of contract labor. Work may be completed by force account labor (at a reduced cost) if that is available at the time of implementation, but early implementation, prior to the rainy season is essential to prevent hazardous waste release at the site. **Total request is for \$9,000.**

**P6 – Infrastructure Protection:** *Treatment Description* - Remove the French drain located immediately above the top soaking pool, to reduce the risk of it plugging and overland flow delivering sediment, ash and organic debris directly into the upper soaking pool, which is likely given the anticipated increased sedimentation from mobilization of fire-affected soils and organic materials upslope. **Total request is for \$3,500.**

<b>Contract Cost Estimate</b>				
<b>Treatment</b>	<b>Units</b>	<b># of Units</b>	<b>Unit Cost</b>	<b>Total Cost</b>
P5 - Remove human waste from toilet vaults (pump)	Each	2	\$4,500	\$9,000
P6 - Remove French drain	Each	1	\$3,500	\$3,500
<b>Total Cost</b>				<b>\$12,500</b>

#### **I. Monitoring Narrative:**

Treatment monitoring will occur as part of the treatments for weeds, roads, and trail and hot springs infrastructure protection. No additional funding is requested for monitoring.

**Part VI – Emergency Stabilization Treatments and Source of Funds**

Line Items	Units	NFS Lands			\$
		Unit	# of	BAER \$	
<b>A. Land Treatments</b>					
L1a - Invasives Detection/Treatment	acres	153	46	\$7,050	\$0
L1b - Invasives Detection/Treatment (suppression repair)	acres	239	48	\$11,450	\$0
				\$0	\$0
<i>Insert new items above this line!</i>				\$0	\$0
<i>Subtotal Land Treatments</i>				<b>\$18,500</b>	<b>\$0</b>
<b>B. Channel Treatments</b>					
None				\$0	\$0
				\$0	\$0
				\$0	\$0
<i>Insert new items above this line!</i>				\$0	\$0
<i>Subtotal Channel Treat.</i>				<b>\$0</b>	<b>\$0</b>
<b>C. Road and Trails</b>					
RT2 - Storm Inspection and Response	days	1,800	4	\$7,200	\$0
RT13 - Trail Drainage	miles	10,000	0.5	\$5,000	\$0
RT14 - Trail Infrastructure and Protection	miles	15,000	0.5	\$7,500	\$0
<i>Insert new items above this line!</i>				\$0	\$0
<i>Subtotal Road &amp; Trails</i>				<b>\$19,700</b>	<b>\$0</b>
<b>D. Protection/Safety</b>					
P1a - Road Hazard Signs	sign/post	600	2	\$1,200	\$0
P1b - Trail/Recreation Hazard Signs	each	400	11	\$4,400	\$0
P5 - Hazardous Materials (removal)	each	4,500	2	\$9,000	\$0
P6 - Infrastructure Protection (hot springs pools)	each	3,500	1	\$3,500	\$0
				\$0	\$0
<i>Insert new items above this line!</i>				\$0	\$0
<i>Subtotal Structures</i>				<b>\$18,100</b>	<b>\$0</b>
<b>E. BAER Evaluation</b>					
Initial Assessment	report	estimate		<b>\$60,000</b>	
<i>Insert new items above this line!</i>				---	\$0
<i>Subtotal Evaluation</i>				---	<b>\$0</b>
<b>F. Monitoring</b>					
					\$0
				\$0	\$0
<i>Insert new items above this line!</i>				\$0	\$0
<i>Subtotal Monitoring</i>				<b>\$0</b>	<b>\$0</b>
<b>G. Totals</b>					
Previously approved					
Total for this request				<b>\$56,300</b>	<b>\$0</b>

**PART VII - APPROVALS**

1.   
for  
Forest Supervisor (signature) 16/17/18  
Date
2.   
Alabio C. Borgess for Glenn Casamassa  
Regional Forester (signature) 10/25/2018  
Date